3.4/51 $p(t) = \frac{200t}{t+2}$ $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

a) for $t \geq 0$, $p'(t)$ represents instantaneous rate of change (growth rate) at any time t

$$p'(t) = \frac{(200)(t+2) - (200t)(1)}{(t+2)^2}$$

$$= \frac{400}{(t+2)^2}$$

b) $p'(5) = \frac{400}{7^2}$

c) examine $p'(t)$. The denominator keeps growing as t increases from 0, & this makes the entire fraction smaller.

so $p'(t)$ is greatest when $t = 0$

d) evaluate & interpret $\lim_{t \to \infty} p'(t) = \lim_{t \to \infty} \frac{400}{(t+2)^2} = 0$

"As time goes on, the growth rate approaches 0, meaning the population grows more and more slowly"

e) graph it

52) $\frac{d}{dt}\left(1 + 7e^{-0.2t}\right) = 7\frac{d}{dt}\left(e^{-0.2t}\right) = 7\left(-0.2e^{-0.2t}\right)$

$= -1.4e^{-0.2t}$

3.4/55

$f(x) = xe^{2x}$

$(fg)' = f'g + fg'$

a) slope = 0 where?

$f'(x) = \frac{d}{dx}(x) \cdot e^{2x} + x \cdot \frac{d}{dx}(e^{2x})$

$= e^{2x} + 2xe^{2x} = \cancel{e^{2x}(1+2x)}$

$\cancel{f'(x) = 0 = e^{2x}(1+2x)}$

$\cancel{\Rightarrow 1+2x = 0 \Rightarrow x = -\frac{1}{2}}$

b) blah blah horizontal tangent

factor $e^{2x} + 2xe^{2x} = e^{2x}(1+2x)$

$= 0$? $e^{2x}(1+2x) = 0$

$\hookrightarrow 1+2x = 0$ or $x = -\frac{1}{2}$

$\hookrightarrow e^{2x} = 0$, impossible

3.4/74

	1	2	3	4
$f(x)$	5	4	3	2
$f'(x)$	3	5	2	1
$g(x)$	4	2	5	3
$g'(x)$	2	4	3	1

Important

$$\frac{d}{dx}\left(f(x)\,g(x)\right)\Big|_{x=1} = \left[f'(x)g(x)+f(x)g'(x)\right]\Big|_{x=1}$$

"find the derivative w.r.t. x of f(x) TIMES g(x), and then evaluate it when x=1"

$$= f'(1)\cdot g(1)+f(1)g'(1)$$

$$=(3)(4)+(5)(2)=22$$

75) $$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right)\Big|_{x=2} = \frac{f'(x)g(x)-f(x)g'(x)}{(g(x))^2}\Big|_{x=2}$$

$$=\frac{f'(2)g(2)-f(2)g'(2)}{(g(2))^2}=\frac{5\cdot 2-4\cdot 4}{2^2}$$

$$=\frac{-6}{4}=\frac{-3}{2}$$

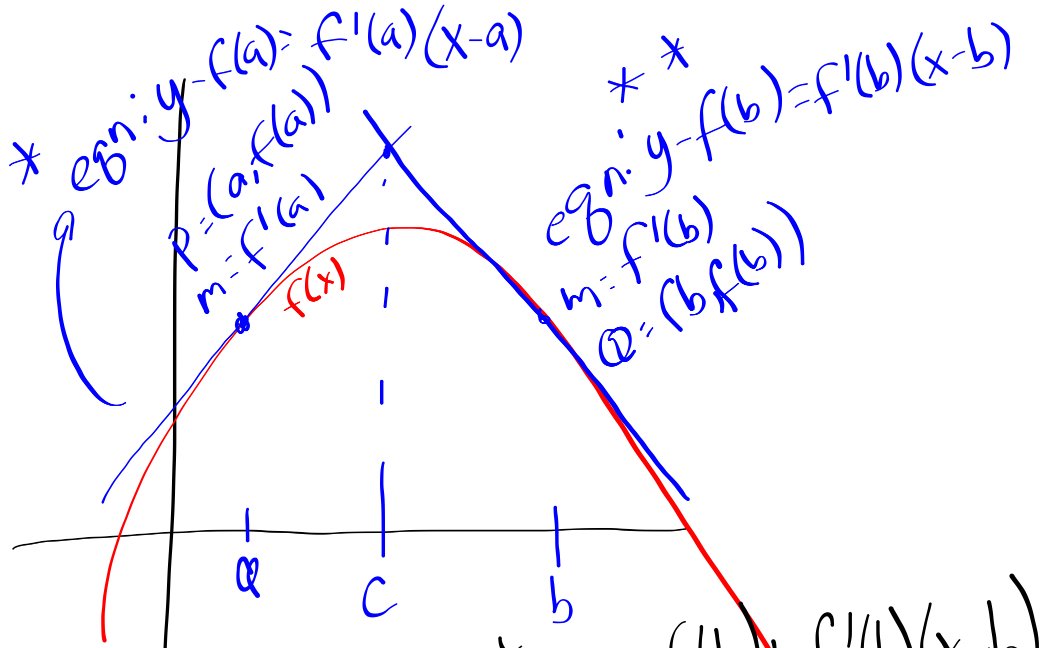
83) find nonconstant functions $f(x)$ and $g(x)$ with

$$\frac{d}{dx}\left(f(x)\cdot g(x)\right) = f'(x)\cdot g'(x)$$

which is not usually true

Oct 7-8:02 AM

86d)



$* \quad y = f(a) + f'(a)(x-a) \qquad ** \quad y = f(b) + f'(b)(x-b)$

So $f(a) + f'(a)(x-a) = f(b) + f'(b)(x-b)$

$f(a) + f'(a)x - af'(a) = f(b) + f'(b)x - bf'(b)$

$\left(f'(a) - f'(b)\right)x = f(b) - f(a) + af'(a) - bf'(b)$

2pts: 1-8, 17

3pts: 9-11, 13-14

5pts: 12

7pts: 15

4pts: 16

→ why this wasn't fair

→ other reactions in general

→ for ~~eg~~ each question not perfect.

* create a perfect answer
* explain your thinking on test & how it's fixed

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Q17) $\infty - \infty$ IS NOT 0

[[more to come....]]

$$\lim_{x\to\infty} (x+1)-(x) = ?$$

$$\lim_{x\to\infty} \frac{\sqrt{x+3}-x}{1} \cdot \frac{\sqrt{x+3}+x}{\sqrt{x+3}+x} =$$

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